U.S. Department
of Transportation

**Research and
Special Programs
Administration**

FEB 11 2000

400 Seventh Street, S.W.
Washington, D.C. 20590

DOT-E 10922
(TWELFTH REVISION)

EXPIRATION DATE: January 31, 2002

(FOR RENEWAL, SEE 49 CFR § 107.109.)

1. GRANTEE. FIBA Technologies, Inc., (FIBA)
Westboro, MA

2. PURPOSE AND LIMITATION. This exemption authorizes the use of certain DOT Specification 3A or 3AA cylinders for the transportation in commerce of the compressed gases listed in paragraph 6 below. The cylinders are retested by utilizing the 100 percent ultrasonic examination (UE) procedures described in paragraph 7 below in place of the internal visual inspection and the hydrostatic retest required in § 173.34(e). This exemption provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein.

3. REGULATORY SYSTEM AFFECTED. 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED. 49 CFR §§ 173.34 (e)(1), (e)(3), (e)(4), (e)(8),(e)(14),(e)(16), and 173.302(c)(2), (3), (4), and (5) in that the ultrasonic examination is performed in place of the hydrostatic pressure test and internal visual examination.

5. BASIS. This exemption is based on FIBA's application dated August 2, 1999, submitted in accordance with § 107.109.

6. HAZARDOUS MATERIALS (49 CFR § 172.101).

Proper Shipping Name/ Hazardous Materials Description	Hazard Class/ Division	Identi-fication Number	Packing Group
Liquefied or nonliquefied compressed gases, or mixtures of such compressed gases, authorized in the Hazardous Materials Regulations for transportation in DOT 3A and 3AA cylinders.	Specific Hazard Class and Division applicable to the compressed gas or gas mixture to be shipped.	As listed in 49 CFR Part 172.101 for specific compressed gas or gas mixture.	N/A

7. SAFETY CONTROL MEASURES.

a. Packaging. Packaging prescribed is a DOT Specification 3A or 3AA cylinder that is subjected to periodic retesting, reinspection and marking prescribed in § 173.34(e), except that the cylinder is examined by ultrasonic method in place of the hydrostatic pressure test and internal visual inspection prescribed in § 173.34(e)(1). Each cylinder must be retested and marked in accordance with the procedure described herein and FIBA's application for exemption on file with the Office of Hazardous Materials Exemptions and Approvals (OHMEA). A cylinder that has been exposed to fire or to excessive heat (temperatures of 1000°F. or greater) must not be retested under the terms of this exemption.

b. Ultrasonic equipment: The ultrasonic examination (UE) equipment used in accordance with the test procedure will be of a pulse echo type and incorporate multiple transducers arranged to perform straight and angle beam examinations. The ultrasonic pulses must enter into the cylinder wall in both longitudinal and circumferential directions to ensure 100 percent coverage of the cylinder wall. All defects must be detected and measured. The UE equipment will be equipped with software that is capable

of meeting all acceptance/rejection criteria described in paragraph 7.d. of this exemption. The transducers must be arranged so that the ultrasonic beams are focused on a single location in the cylinder wall and all beams exit at the same location. The equipment will incorporate continuous automatic monitoring of the transducer to cylinder wall acoustic coupling to assure 100 percent cylinder wall coverage during the ultrasonic examination. It must be equipped to discern and abort the test when the ultrasonic data indicate a loss of acoustic coupling between the transducer assembly and the cylinder wall. This safety control measure should be an integral part of the test equipment design incorporating Lack-of-Expected-Response (L.E.R.) monitoring independent of operator actions.

c. Equipment performance and test procedure: The ultrasonic equipment performance, test procedure, and rejection criteria must conform to FIBA's application except as specifically stated herein:

(1) Calibration Standards [FIBA APPENDIX I, Section I.1.5, (Revised)].

(i) A cylinder used as a calibration standard must be of the same surface finish and metallurgical condition as the cylinders under test. The calibration standard cylinder must have a known minimum design wall thickness which is less than or equal to the cylinders under test. For the purpose of testing under this exemption, FIBA must have calibration cylinders that conform to the following:

(A) A calibration standard cylinder for testing cylinders 6-inch or smaller in diameter must have the same diameter.

(B) A calibration standard cylinder for testing cylinders larger than 6-inch in diameter must conform to the following sizes:

Calibration Standards	Cylinders Tested
Cal. Cyl. (OD)	Cyl. Size (OD)
7 in.	6.5 to 8 in.
7.5 in.	6.5 to 8 in.
9 in.	8.25 to 10 in.
9.25 in.	8.5 to 10 in.
10 in.	9 to 14 in.
12 in.	10 to 16 in.
14 in.	14 to 18 in.
14.25 in.	14 to 18 in.
18 in.	18 to 24 in.
22 in.	20 to 26 in.
24 in.	24 to 30 in.

(C) Prior to machining for calibration defects and minimum wall thickness, the average minimum wall thickness for the calibration cylinder must be determined by means of an independent method. The calibration cylinder must be machined with defects simulating those that occur during service conditions, such as reduction in wall thickness (area corrosion), and line corrosion. The remaining wall thickness must conform to the design minimum wall for a cylinder under the test.

(ii) The calibration cylinders must contain artificial defects on the inside surfaces that simulate wall thinning and line corrosion.

(A) A defect for reduction in wall thickness (area corrosion). Area corrosion must be less than or equal to 0.70 square inch (in^2) and less than or equal to 1/20 of the design minimum wall thickness (t_m) in depth. The remaining wall thickness must conform to the design minimum wall for a cylinder under the test. To achieve the reduction in wall thickness, a minimum of one area must be machined in the cylinder inside wall.

(B) A defect for isolated pits consisting of an internal flat bottom hole of 1/8 inch diameter and $1/3t_m$ in depth for cylinders less than or equal to 4 inches in diameter.

(C) A defect for isolated pits consisting of an internal flat bottom hole of 1/4 inch diameter and $1/3t_m$ in depth for cylinders greater than 4 inches in diameter.

(D) A defect for line corrosion in the side to base transition (SBT) area consisting of an internal circumferential notch $0.10t_m$ in depth, 1 to 1.5 inches long and less than or equal to 0.03 inch width located at SBT.

(iii) A drawing representing the above defects and a certification statement signed by a person certified as a Level III operator (in UE) must be available for inspection for each calibrated cylinder at each site where testing is performed. A calibration standard drawing must identify dimensions (length, width, diameter, and depth) of each artificial defect and location of each artificial defect from a known reference point (e.g. longitudinal line corrosion 5 inches from the base).

(2) Calibration of Equipment [FIBA APPENDIX I, Section I.1.6, (Revised)].

System calibration must be performed using the calibration standards referenced in section 7.c.(1) of this exemption. The equipment may not allow testing

of a cylinder unless the system has been properly calibrated.

(3) TEST PROCEDURE [FIBA APPENDIX II, Section I Step (18),(Revised)].

A written test procedure for performing UE of cylinders under the terms of this exemption must be at each facility performing ultrasonic examination. At a minimum, this procedure must:

(i) include a description of the test set-up; test parameters; transducer model number, frequency, and size; transducer assembly; couplant used; system calibration method and threshold gain used during the test; and other pertinent information such as additional gain used during the UE to confirm the defects.

(ii) require re-calibration of the test equipment when ultrasonic examination of 200 cylinders has been completed, or a time period of more than 4 hours has elapsed since equipment calibration, whichever occurs first. The equipment must be re-calibrated in accordance with paragraph 7.c.(2).

(iii) require that the rotational speed of a calibration piece must be such that all artificial defects are adequately detected, measured and recorded. The rotational speed of the cylinder under UE must not exceed the rotational speed used during the calibration.

(iv) be made available to a DOT official when requested. Any change to the written procedure must be submitted to OHMEA as soon as practicable.

d. Ultrasonic Examination Acceptance/Rejection Criteria.

The equipment calibration, set up for testing and test procedure must be such that any cylinder found with the following defects must be rejected:

(1) In any area 0.70 in^2 or larger, the remaining wall thickness is less than the design minimum wall thickness (t_m) or the maximum wall stress exceeds 58,000 psi for DOT-3A or 73000 psi for DOT-3AA specification cylinders. The maximum wall stress is calculated from the following formula:

$$S = P(1.3D^2 + 0.4d^2)/(D^2 - d^2)$$

where:

S = wall stress in pounds per square inch;
P = minimum test pressure in pounds per square inch;
D = outside diameter in inches;
d = D-2t, where t=minimum wall thickness determined by ultrasonic testing, in inches.

(2) Isolated pits deeper than $1/3t_m$ and larger than 1/8" diameter for cylinders less than or equal to 4" in outside diameter, or larger than 1/4" diameter for cylinders greater than 4" in outside diameter.

(3) A defects for line corrosion in the sidewall to base (SBT) area that is deeper than $0.20t_m$ and longer than 1.5".

e. Rejected cylinders. When a cylinder is rejected, the retester must stamp a series of X's over the DOT specification number and marked service pressure, or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp, and must notify the cylinder owner, in writing, that the cylinder is rejected and may not be filled with hazardous material for transportation in commerce.

(1) Alternatively, at the direction of the owner, the retester may render the cylinder incapable of holding pressure.

(2) If a condemned cylinder contains hazardous materials and the testing facility does not have the capability of safely removing the hazardous material, the retester must stamp the cylinder "CONDEMNED" and affix conspicuous labels on the cylinder(s) stating: "UT REJECTED DOT-E 10922. RETURNING TO ORIGIN FOR PROPER DISPOSITION". The retester may only offer the

condemned cylinders by motor vehicle operated by a private carrier to a facility, identified to, and acknowledged in writing with OHMEA, that is capable of safely removing the hazardous material. A current copy of this exemption must accompany each shipment of condemned cylinders transported for the disposal of hazardous material.

f. Marking. Each cylinder passing retest under the provisions of this exemption must be marked as prescribed in § 173.34(e)(6). In addition, each cylinder must be marked UE, in characters not less than 1/4 inch high at a location close to the retester's marking.

g. Report. A report must be generated for each cylinder that is examined. The ultrasonic examination (UE) report must include the following:

(1) UE equipment, model and serial No.
(2) Transducer specification, size, frequency and manufacturer.
(3) Specification of the calibration standard used to UE the cylinder. Calibration standards must be identified by serial number or other stamped identification marking.
(4) Cylinder serial no. and type.
(5) UE technicians' name and certification level
(6) Test Date
(7) Location and type of each defect on the cylinder (e.g. longitudinal line corrosion 5 inches from base).
(8) Dimensions (area, depth and remaining wall thickness) and brief description of each defect.
(9) Acceptance/rejection results.
(10) The UE report must be on file at the test site, and made available to a DOT official when requested.

h. Personnel Qualification: Each person who performs retesting or who evaluates or certifies retest results must meet the following requirements:

(1) Project Manager - is the senior manager of FIBA responsible for compliance with DOT regulations including this exemption. Additionally, the project

manager must ensure that each operator and senior review technologist maintain the required ASNT certification.

(2) The personnel responsible for performing cylinder retesting under this exemption shall be qualified to an appropriate Level (Level I, II or III)- Ultrasonic Testing in accordance with the American Society for Nondestructive Testing (ASNT) Recommended Practice SNT-TC-1A depending upon the assigned responsibility as described below:

(i) As a minimum, a Level II Operator must perform system startup, calibrate the system, and review and certify the test results when a written acceptance and rejection criteria for cylinders have been provided by a Senior Review Technologist. Based upon written criteria, the Level II Operator may authorize cylinders that pass the retest to be marked in accordance with paragraph 7(f) of this exemption. However, a person with Level I certification may perform a system startup, check calibration, and perform ultrasonic testing under the direct guidance and supervision of a Senior Review Technologist or a Level II Operator, either of whom must be physically present at the test site so as to be able to observe testing conducted under this exemption.

(ii) Senior Review Technologist (SRT) - is a person who reviews overall test results, provides supervisory training and technical guidance to operators, and reviews and verifies the retest results. A SRT must have a Level III Certification in UE, and a thorough understanding of the HMR pertaining to the re-qualification and reuse of the DOT cylinders authorized under this exemption. The SRT must prepare and submit the reports required in paragraphs 7(h) and annually verify that the UE program is being operated in accordance with the requirements of this exemption.

i. OPERATIONAL CONTROLS.

(1) No person may perform inspection and testing of cylinders subject to this exemption unless -

(i) that person is an employee or agent of FIBA and has a current copy of this exemption at the location of such inspection and testing, and

(ii) complies with all the terms and conditions of this exemption.

(2) The marking of the retester's symbol on the cylinders certifies compliance with all of the terms and conditions of this exemption.

(3) Each facility approved by OHMEA to test cylinders under the terms of this exemption must have a resident operator with at least a Level II Certification in UE.

8. SPECIAL PROVISIONS.

a. During the initial use of a new UT system, the ultrasonic examination data, results, and additional technical information deemed pertinent in successful application of the retest procedure shall be reported to OHMEA. The purpose of this information is to determine whether certain testing procedures and criteria require modification. For any rejected cylinder, the defect causing the rejection must be fully characterized and profiled. That is, the specific type of defect should be identified (i.e. isolated pits, line corrosion or SBT crack) and the specific size of the defect should be determined (i.e. length, depth, width, diameter, area, etc.). The cylinder type, size, minimum design wall thickness, age, etc. of the rejected cylinder must be reported. The ultrasonic signal profile should be reported for any defect causing the cylinder to be rejected. These results must be summarized and reported to OHMEA on an annual basis. FIBA must submit to DOT an evaluation of the effectiveness of the ultrasonic examination program authorized by this exemption as part of any request to renew the exemption submitted in accordance with § 107.109.

b. The total number of cylinders examined under this exemption must be reported by type (i.e. 3A, 3AA) and age. The number of cylinders rejected and the total number of cylinders tested in each lot inspected under the provision of this exemption shall be reported by cylinder type and age. These results must be summarized and reported to DOT on an annual basis.

c. A cylinder that meets the requirements of this exemption and the introductory text and paragraph (1) of § 173.302(c) may be marked with a plus sign (+) following the test date marking on the cylinder. In addition, a cylinder that meets the requirements of this exemption and of § 173.34(e)(16) may be marked with a "star".

d. Offerors may use the cylinders specified when examined in accordance with the provisions of this exemption for the transportation in commerce of those hazardous materials specified herein, provided no modifications or changes are made to the cylinders, and all terms of this exemption are complied with.

e. All ultrasonic examination (UE) systems installed in a retest facility after the issuance DOT-E 10922 (12th Revision) or used for replacement of an existing UE system must be capable of detecting and measuring all of the defects described in paragraph 7 of this exemption.

f. The following provisions apply to a cylinder being examined by a UE system installed at a retest facility prior to the issuance of DOT-E 10922 (12th Revision):

(1) UE'S operators must continuously watch the incoming test data on the system's monitor (e.g. CRT). Each UE operator must be instructed on how to observe each type of defect described in DOT-E 10922 (ELEVENTH REVISION), i.e. area corrosion, and line corrosion. The written procedure must describe type and dimensions of each possible defect;

(2) A cylinder which may have one of the described defects must be set aside and checked for acceptance by a level II or level III ultrasonic tester using a

portable UE instrument and proper transducers (e.g. shear waves for defects other than area corrosion) using the criteria in DOT-E 10922 (ELEVENTH REVISION)

(3) An internal visual inspection must be performed on each cylinder in accordance with §173.34(e) except for a cylinder in either of the following services:

(i) cylinders used in non-corrosive gas service and that meet the requirements to be marked with a star pursuant to § 173.34(e)(16);

(ii) cylinders used for gases or gas mixtures that have a dew point lower than -70°F and mixtures of those gases where the final gas mixture has a dew point lower than -70°F. The cylinder owner must certify to the UE retester that the gas or gas mixture in the cylinder to be retested has been in 100% consistent "dry gas" service. The certification must include the serial number of each cylinder. "Dry gas" service means that the contents have a dew point of -70°F or lower since the last time the cylinder had an internal visual inspection. Any time a cylinder valve is removed for repair or replacement an internal visual inspection must be done and the results recorded and retained by the cylinder owner.

9. MODES OF TRANSPORTATION AUTHORIZED. Motor vehicle, rail freight, cargo vessel, passenger carrying aircraft, and cargo-aircraft only.

10. MODAL REQUIREMENTS. None, other than as required by the HMR.

11. COMPLIANCE. Failure by a person to comply with any of the following may result in suspension or revocation of this exemption and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:

- All terms and conditions prescribed in this exemption and the Hazardous Materials Regulations, 49 CFR Parts 171-180.

- o Registration required by § 107.601 et seq., when applicable.

Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this exemption must receive training on the requirements and conditions of this exemption in addition to the training required by §§ 172.700 through 172.704.

No person may use or apply this exemption, including display of its number, when this exemption has expired or is otherwise no longer in effect.

12. REPORTING REQUIREMENTS. The carrier is required to report any incident involving loss of packaging contents or packaging failure to the Associate Administrator for Hazardous Materials Safety (AAHMS) as soon as practicable. (Sections 171.15 and 171.16 apply to any activity undertaken under the authority of this exemption.) In addition, the holder(s) of this exemption must inform the AAHMS, in writing, of any incident involving the package and shipments made under the terms of this exemption.

Issued in Washington, D.C.:

FEB 11 2000

Robert A. McGuire
Acting Associate Administrator for
Hazardous Materials Safety

(DATE)

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Research and Special Programs Administration, Department of Transportation, Washington, D.C. 20590. Attention: DHM-31.

The original of this exemption is on file at the above office. Photo reproductions and legible reductions of this exemption are permitted. Any alteration of this exemption is prohibited.

Copies of exemptions may be obtained from the AAHMS, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590-0001, Attention: Records Center, 202-366-5046.

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